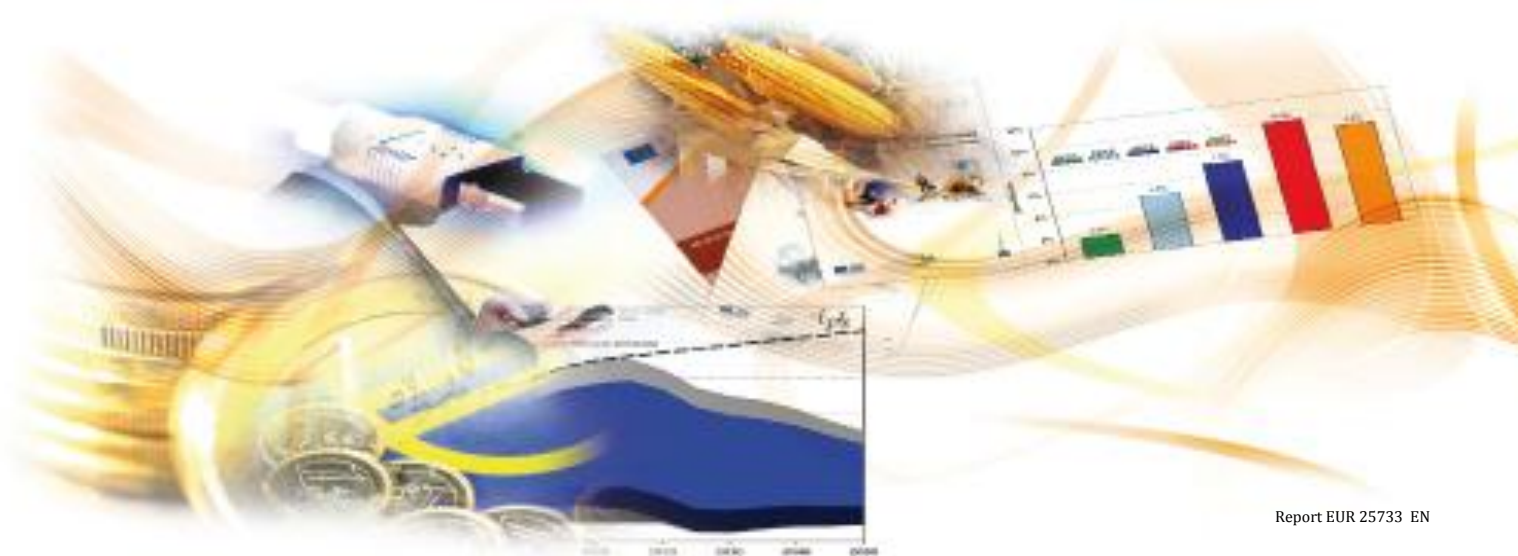


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Executive Summary

Bosnia and Herzegovina (BiH) is in the process of establishing its own science system and science policy. Legal and institutional framework for stimulating innovations is yet to be established. BiH has recently developed its legal and policy framework by adopting the [“Framework law on Scientific Research Activities and the Coordination of Internal and International Scientific Co-operation in BiH”](#) (2009). In parallel, the [“Strategy for the Development of Science in BiH 2010-2015”](#) on the state level was adopted in 2009 that represent a significant step forward. As the first two years of Science Strategy elapsed, objectives remain to be fulfilled most notable in the area of establishment of a national R&D statistics. Entities (Republic of Srpska and Federation of BiH) strategies on technological and scientific development are in the phase of public consultation (Dec. 2011) and will most probably be adopted in 2012. Out of ten, only three cantons have passed legislation in FBiH on the organisation of scientific research (Canton Sarajevo, Zenica Dobož and Tuzla) within their territory. In RS, research activities are organised in accordance with the “Law on science research activities of RS” (2007, 2010, and 2012). New law on scientific activities and technological development in RS was adopted in December 2011 (Official Gazette of Republic Srpska no. 6/12). Other manages the sector under the old ex Yugoslav law of Socialist Republic of BiH (Official Gazette SR BiH 38/90). The development of the recent policies remains to be done in the future.

Investment in research is very limited. Statistics on research and development activities are lacking. No national data exist on business, foreign and private non-profit funding on R&D. The Entities and cantons fund their specific policies through their own budgets. This makes it difficult to streamline research policies and avoid fragmentation, one of the key European Research Area (ERA) objectives. In the absence of overall statistics for research and development (R&D) activities in BiH, it is difficult to come up with an exact evaluation of public investment in such activities. According to the strategy Development for Science in BiH 2010-2015, BiH invests around €9m per year or approximately 0.07% of its GDP on R&D which is still far below the EU-27 average of 2.01% in 2009. The only data available so far is from the entity of Republic of Srpska for 2010. According to statistical research conducted in 2011 (“Research and Development, 2010”, Research and Development statistic, Republika Srpska Institute of Statistic, Annual release No.219/11) the following data is reported: GERD 0.25% of GDP, BERD 0.1% of GDP, GOVERD 0.024% of GDP, HERD 0.21% of GDP and non-profit funding 0.024% of GDP. Such data does not exist on the level of other entity Federation of BiH. The investment in R&D in 2010 has decreased due to the stagnant economy over the last three years. The allocated R&D budget in RS (Ministry of Science and Technology of RS, 2011) was €3.1m in 2008, €2.6m in 2009 and €2m in 2010 while in FBiH (Federal Ministry of Education and Science (2010), €2.2m in 2008, €0.8m in 2009 and €1.6m in 2010. In FBiH in 2010, Sarajevo canton provided €2.8m, Tuzla canton €0.82m and Zenica-Dobož Canton €0.04m (Federal Ministry of Education and Science, 2010).

The combination of **weak demand for local R&D** and innovation, on the one hand, and **weak private sector**, on the other, **are the biggest bottlenecks** to more effectively harnessing S&T to socio-economic growth of Bosnia Herzegovina.

- **Domestic demand for R&D** and for skilled employees is relatively weak due to the structure of industry, which is dominated by small firms working in

traditional industries that do not exploit new technologies.

- Reason for **weak private sector** involvement in research policy-making lies in the low levels of the technology, the innovative and absorptive capabilities of the companies.
- **Knowledge and Technology transfer**

The local demand for R&D and innovation is constrained both by weak universities and also by weak business sector. The upgrading of solely teaching universities to research entrepreneurial and research based teaching organisations and of intermediary transfer institutions into universities is of great challenge for the further development of innovation capacities of BiH.

Research policy in BiH is mainly generic in character while sectoral R&D policies or support for specific thematic areas are not very common in policy practice. The main policy instruments for financing scientific research (programme for scientific and research activities) follows a horizontal approach to assure the balanced development of the six main fields of science (agriculture science, natural science, engineering and technology, medical and health sciences, social sciences and humanities). The engineering and technology takes the biggest share of the budget, approximately 30% or €2.7m.

The Strategy for the Development of Science in BiH – 2010-2015 is the document that summarizes the main objectives, implementation instrument and budget allocation for scientific research in BiH. It states that the main challenge for BiH in the forthcoming period is to derive value from knowledge and to build the knowledge based society. The overall aim is to stimulate scientific excellence and enable the transfer of knowledge and results of scientific discoveries to industry and business in order to increase competitiveness and generate sustainable growth and productivity.

It is hard to recognise a policy mix for research in BiH. Most of the documents guiding research, innovation and other policies affecting research have been adopted only in the past two years, usually with no coordination between them. The bulk of these strategic papers have not yet been translated into specific policy actions, which hampers efforts to distinguish a policy mix in practice. The main reason for the slow implementation of most research-related strategies is the lack of sufficient and thematically coherent financing to underpin them.

National policy mix is showing some first concrete steps towards alignment with ERA pillars and objectives. However, more efforts need to be taken in order to address the strategic challenges outlined above and achieve further alignment with the ERA. Some of the key challenges include increasing inward and outward mobility of researchers, increasing the proportion of researchers in the private sector, developing research infrastructures and securing their efficient utilisation, reforming research and higher education (through improved funding mechanisms, quality assurance, and accountability), developing science - industry collaboration and internationalisation.

Future policy should revise the current science and technology policy and an action plan with monitoring their implementation on an annual basis and above all perform regular evaluation of science policy (including the work of institutions which are responsible for policy implementation).

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1 Introduction

Bosnia and Herzegovina (BiH) is located in the Southeast Europe, bordering Croatia to the north and southwest, Serbia to the east, and Montenegro to the southeast. The total area is 51,209 km² and population is 3,843,126¹ (30 June 2010) accounting for less than 1% of the population of the EU-27.

Considerable progress has been made since peace was re-established following the Dayton Accords. Still regarded as a transition economy, BiH sees the long-term goal of EU membership as a driver to further economic growth and development. In 2010 the country's GDP amounted to €12,519m or € 3,258 GDP per capita². After the recession in 2009 with a drop in real GDP of 3.1%³, the country moderately recovered in 2010. It recorded a positive real growth rate of 0.8%⁴. Per capita income, measured in purchasing power standards (PPS), fell to 30% of the EU-27 average in 2010⁵ from 31% in 2009⁶. The average unemployment rate in 2010 stood at a very high rate 27.2%⁷.

Investment in research and innovation (R&D) is very limited. Although the national Statistics Office was established in 1997 it does not provide any R&D statistics, some relevant indicators being available only for the Entity of Republic of Srpska. According to [the Strategy Development for Science](#) in BiH 2010-2015, BiH invests around 0.07% of its GDP on R&D however, it is estimated that total investment is as high as 0.1 to 0.14% of its GDP (budget, industry and services sector together) which is far below the EU-27 average of 2.01% in 2009. According to statistical research conducted in 2011⁸ for the Republic of Srpska GERD was 0.25%, BERD 0.1%, GOVERD 0.024%, and HERD 0.21% of GDP. Such data does not exist for FBiH. In 2010 the total GBOARD in Republic of Srpska (RS) was €4.35m or app. 0.1%⁹ GDP while in Federation of BiH (FBiH) the allocated budget amounted to €1.6m or less than 0.05%¹⁰ of its GDP. Sarajevo canton provided €2.8m, Tuzla canton €0.82m and Zenica-Doboj Canton €0.04m¹¹.

¹ BiH in figures 2011, [Agency for Statistics BiH](#)

² BiH in figures, 2011, *ibid*

³ World Development Indicators 2011, World Bank available at: http://www.google.com/publicdata/explore?ds=d5bncppjof8f9_&met_y=ny_gdp_mktp_kd_zg&idim=country:BIH&dl=en&hl=en&q=gdp+growth+in+bosnia

⁴ World Development Indicators, 2011, *ibid*

⁵ Bosnia and Herzegovina 2011 Progress Report available at: http://ec.europa.eu/enlargement/pdf/key_documents/2011/package/ba_rapport_2011_en.pdf

⁶ Bosnia and Herzegovina Progress Report, 2011, *ibid*

⁷ BiH in figures 2011, [Agency for Statistics BiH](#)

⁸ Research and Development, 2010, Research and Development statistic, Republika Srpska Institute of Statistic, Annual release No.219/11

⁹ Science and Technological development Strategy of RS 2011 – 2016, (draft, in Serbian). Available at: <http://www.vladars.net/sr-SP-Cyrl/Vlada/Ministarstva/mnk/PAO/Strategije/Pages/default.aspx>

¹⁰ Information on state of Science in FBiH, Mostar, Decembar 2010, (in Bosnian, Croatian), Available at: http://www.fmon.gov.ba/index.php?option=com_docman&task=cat_view&gid=48&Itemid=132

¹¹ Information on state of Science in FBiH, 2010, *ibid*

in previous paragraph, estimated value of BiH's gross domestic expenditure on R&D

BiH accounts for extremely low level of R&D inputs and outputs. As already indicated is estimated between 0.1 to 0.14% of GDP. The main source of R&D funding is the governments (FBiH, RS, cantons). The total actual R&D budget in BiH in 2010 (state, entities and cantonal governments) was €9.86m. The higher education sectors receive the biggest part, approximately 80%,¹² while the business sector enjoys limited support from government.

Domestic demand for R&D and for skilled employees is relatively weak. There are several reasons for this. The structure of industry is dominated by small firms who are working in traditional industries that do not exploit new technologies. Transfers of top technologies did not accompany arrival of the foreign direct investments (FDI). Multinational Corporations (MNCs) did not shift its research centres to BiH. Interest for investments into the technological development projects is practically negligible in BiH. Such structural features indicate a relatively slow transformation of R&D towards enterprise-based R&D systems.

BiH has no data available for human resources devoted to S&T (HRST). Human resources in BiH were severely affected by the break-up of former Yugoslavia. War and economic crises adversely affected the human resources and R&D potential. The so-called brain drain resulted in the loss of experts who have left BiH to seek new employment opportunities abroad. In the Global Competitiveness Report (GCR) 2010-2011 BiH was ranked 138th (Global Competitiveness Report, 2010–2011) out of the 139 countries studied in respect to the brain drain.

According to the Science Citation Index Expanded¹³, in 2008 they were 287 scientific publications and 76 scientific papers per million populations in BiH. According to the data obtained by the Federal ministry of Education and Science¹⁴ data obtained from international databases (SCI-Science Citation Index Expanded, Social Sciences Citation Index, Arts & Humanities Citation Index, Conference Proceedings Citation Index-Science, Conference Proceedings Citation Index-Social Science & Humanities, MEDLINE), there were in absolute figures 595 published papers in 2009 and 498 in 2010. According to [the EC 2011 Progress Report](#), the Institute for Intellectual Property received 49 patent applications and processed 270. When it comes to trademarks, the Institute received 716 applications and processed 1.345. The Institute received 22 industrial design applications and issued 10 decisions granting industrial designs.

The governance of the BiH research system reflects the constitutional structure of the country. Entity ministries play the role of both policymakers and funding bodies as they also manage support measures. The Ministry of Civil Affairs of BiH (MoCA) coordinates science policy at the state level as well as international cooperation through its Department for Science and Culture. Apart from MoCA, the coordination of SME policies at state level is the responsibilities of Ministry of Foreign Trade and Economic Relations of BiH (MoFTER). The two entities, Republika Srpska (RS) and Federation of BiH (FBiH)

¹² Global Investment in R&D, UIS Fact Sheet, August 2011, No. 15, Available at: http://www.uis.unesco.org/FactSheets/Documents/fs15_2011-investments-en.pdf

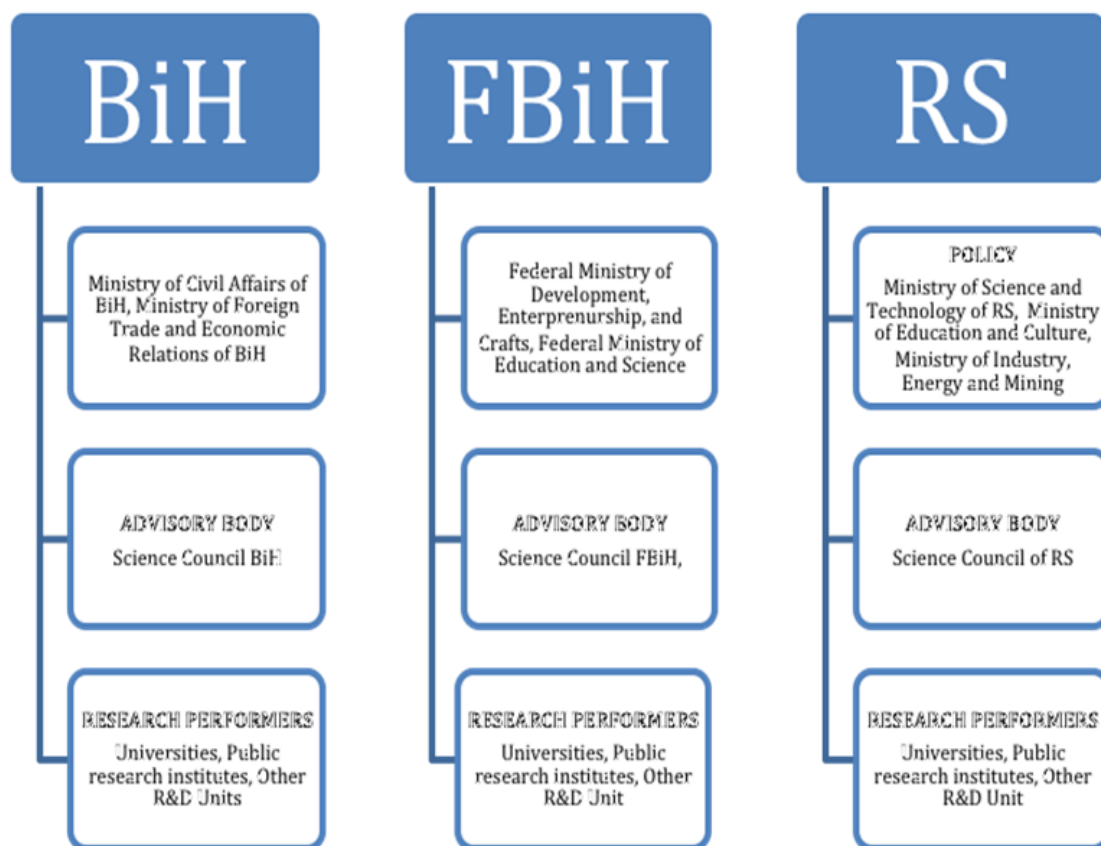
¹³ Publications in Southeast Europe by major field of science, 2008: Thomson Reuters (Scientific) Inc. Web of Science, (Science Citation Index Expanded), compiled for UNESCO by the Canadian Observatoire des sciences et des technologies

¹⁴ Information on state of Science in FBiH, Mostar, decembar 2010, p.21

with its 10 Cantons, coordinate their own specific policies through the entity/cantonal governments.

Public research is mostly undertaken in the universities and research institutes. There are eight public universities (six in FBiH and two in RS). There are nine private universities, three in FBiH and six in RS. In total, there are 140 faculties and 10 academies. The largest University in terms of staff numbers is the University of Sarajevo, followed by the University of Banja Luka, the University of East Sarajevo, the University of Tuzla, the University of Mostar, “Dzemail Bijedic” University of Mostar, the University of Zenica and the University of Bihac. As far as research institutes are concerned there are 23 in RS (16 public and 5 private) and 30 in FBiH (20 public and 10 private). There are two Academies of Arts and Science: Academy of Arts and Science of BiH (active on the territory of the FBiH) and the Academy of Arts and Science of RS.

Figure 1: Overview of the governance structure of the BiH research system



2 Structural challenges faced by the national system

The bottleneck caused by little domestic demand for R&D and a weak private sector is likely to remain a major structural weakness for SEE (South East Europe) R&D systems, including BiH (Radosevic, 2007).

The post-war economic growth of Bosnia and Herzegovina (BiH) was based on domestic demand, stimulated by foreign investment, raw materials and relatively cheap labour. With the onset of the worldwide financial crisis in 2008-2009, foreign investment reduced considerably thus augmenting the problem of the country's low economic

competitiveness. The issue of the future sources of economic growth is one of the most important matters for the country to address.

It may be claimed that future economic growth of BiH requires an increased efficiency or productivity, as well as a larger share of domestic know-how in export products and services. The period between 1997 and 2007 witnessed an important level of industrial restructuring in terms of reconstruction and modernisation of the pre-war industrial base, based on wood-processing, metal-working, textile and motor-car industries (Kaminski, B. and Francis Ng, 2010). This process needs to continue, although this is not yet possible as there is no national innovation system in place. Improvements in quality, adaptation of foreign technologies to national conditions, as well as sustained product and process innovations will not be possible without innovative companies, an educated labour force and a more complex research and development (R&D) system as indicated in the [Innovation Union Competitiveness \(IUC\) report](#). BiH wouldn't be able to achieve long-term growth on the basis of cheap and unskilled labour; rather it has to increase the share of professional labour, quality and national innovativeness, as well as a quality adaptation to and use of foreign technologies and software. This shift will not be possible only at enterprise level without reforming the higher education and vocational education and training systems or without support to companies to increase innovation activities.

The BiH R&D system has almost fully disappeared, which is a consequence of the past war. It needs to be re-built, not only at universities and institutes, but also in the business enterprise sector. The R&D functions in the environment of a very low income per capita in BiH of \$4,409 (the WB data for 2010¹⁵). Creation of one's own know-how is important, but it is far more efficient to achieve absorption and diffusion of new technologies. This means that R&D and the innovation system of BiH cannot be a sheer imitation of the system of developed countries rather, they have to be oriented much more to mastering, adapting to and applying successfully the old know-how and technologies. It is necessary to strengthen national research and development capabilities, as well as the role of universities and institutes in technology transfer. Catching-up with developed countries is not the issue of imitation, but the issue of adaptation and innovation, which requires increased investments in R&D as well the creation of preconditions for innovations in the business enterprise sector. In this context, not only does science in BiH need to contribute to scientific development but also to increased educational attainment, successful use of new instruments or tools and technologies, and to enterprise start-up and expansion. This shift or the building of a national science, technology and innovation system integrated into the EU cannot take place overnight. It requires a social consensus and full stakeholder agreement, as well as much better knowledge of national restrictions and abilities and also a better knowledge of BiH's position in the international environment.

Thus, BiH will need to address several challenges in order to use innovative potential, the most important being: (i) increase domestic demand for R&D (ii) increase collaboration with the business sector; (iii) facilitate knowledge and technology transfer.

i. Domestic demand for R&D

The transition to a market economy in BiH has had a strong impact on both the enterprise sector and the innovation performance. The restructuring of the enterprise sector has been led by foreign direct investment, which created a dual economy

¹⁵ http://data.worldbank.org/indicator/NY.GDP.PCAP.CD?order=wbapi_data_value_2010+wbapi_data_value+wbapi_data_value-last&sort=asc.

situation of highly productive foreign enterprises on the one hand, and domestic firms with less potential to innovate on the other. The potential for their catching up based on new technologies is restricted severely by weak demand for R&D on the part of enterprises at the beginning of the transition. The early years of transformation were also characterised by a decline in research infrastructure.

BiH went through economic transformation from the centrally planned economic system to the market-led system, experiencing heavy losses in R&D expenditure. During the Yugoslav era, research and technological development was given a high political priority in BiH, particularly in certain special industrial sectors.

R&D activities were mainly carried out in public industrial research centres. During the transition, R&D activities have diminished significantly on account of both public and private funding for R&D having been reduced drastically. The number of people employed in the sector decreased, following the disappearance of the number of R&D units. The dramatic decline in markets and restructuring of large firms that were the main customers for R&D led to a sharp decline in business R&D expenditure (BERD). In BiH the past decade has brought, not only the termination of applied research in large companies, but also a substantial decline in domestic demand for modern technology applicable in production. This process was compounded not only by the closure of the large industrial R&D institutes, but also by the restructuring of the main profile of these institutes, as many of them sought out new sources of revenue in short-term services, rather than in long-term research projects.

Therefore, improvements in quality, adaptation of foreign technologies to national conditions, as well as sustained product and process innovations will not be possible without innovative companies, an educated labour force and a more complex research and development (R&D) system.

ii. Weak private sector

An important reason for the current low level of private sector involvement is the under investment of private sector in public R&D. No official data exist but estimates provided by the entities (RS and FBiH) draft strategies support this statement. The low level of technological capabilities and of industrial research in BiH resulted in rather weak ties between science and industry. It is estimated that in 2010 only about 10% of the revenues of the institutes and 6% of the university revenues (est. €0.3m) come from the research contracted with the private sector. The economic reasons for this weak private sector involvement in research policy making are the low levels of the technology, the innovative and absorptive capabilities (Radošević, 2007) of the companies as well as their financial restrictions. During the transition process to a market economy, the industrial R&D sector was largely destroyed. BiH had, prior to 1990, an economy in which industry was significant, with important industrial companies that had established their international competitiveness on a technological basis (Energoinvest was the most prestigious and important). These companies had created and developed large research laboratories with hundreds of researchers each. Almost all this technical expertise disappeared during and after the war, and only a few companies have been able to maintain a minimum of research activity in metallurgy (steel and aluminium), electricity production, pharmaceuticals and food production. It has retained a mining industry (iron ore and coal) and agricultural resources and forests represent an important asset (BiH exports wood). Only a few like Bosnalijek, pharmaceutical industry, is now strong enough to develop in-house research (Kaminski, B. and Francis Ng, 2010).

iii. Knowledge and Technology transfer

BiH has a low level of knowledge and technology transfer. The local demand for R&D and innovation is constrained both by weak universities and also by weak business sector. Most companies are small, do not conduct R&D in house and do not utilise the results of research from R&D institutes and universities. The Universities in BiH show only a small number of partnerships and cooperation with foreign universities, R&D institutes and private companies as well as poor participation in EU and international support programmes. Nevertheless, there are cases where individual research institutes or researchers have been able to establish good links with private companies or research organisations abroad. The upgrading of solely teaching universities to research entrepreneurial and research based teaching organisations and of intermediary transfer institutions into universities is of great challenge for the further development of innovation capacities of BiH.

3 Assessment of the national innovation strategy

3.1. National research and innovation priorities

BiH is in the process of establishing its own science system and science policy. Legal and institutional framework for stimulating innovations is yet to be developed.

Research system in BiH is decentralised across several governments, each enjoying autonomy of decision-making power. The authority over science and research lies within the entities, FBiH and RS as well as Brcko District (BD). In FBiH, the authority has further been transferred to 10 cantons. This division of political and administrative responsibilities among the three levels of government makes it very difficult to define and implement country-level science policy.

At the State level, BiH developed its legal and policy framework in 2009 by adopting the “Framework law on Scientific Research Activities and the Coordination of Internal and International Scientific Co-operation in BiH” and the “Strategy for the Development of Science 2010-2015”. In accordance with the objectives and tasks of the Strategy and the current situation in science in BiH (state of institutions, infrastructure, financial and human resources), priorities for development of science in BiH summarizes the main objectives, implementation instrument and budget allocation for scientific research in BiH (1% of its GDP by 2015). It states that the main challenge for BiH in the forthcoming period is to derive value from knowledge and to build the knowledge based society. The overall aim is to stimulate scientific excellence and enable the transfer of knowledge and results of scientific discoveries to industry and business in order to increase competitiveness and generate sustainable growth and productivity.

Entities (Republic of Srpska and Federation of BiH) strategies on technological and scientific development are in the phase of public consultation (Dec. 2011) and will most probably be adopted in mid 2012.

Research policy in BiH is mainly generic in character while sectoral R&D policies or support for specific thematic areas are not very common in policy practice. The main policy instruments for financing scientific research (programme for scientific and research activities) follows a horizontal approach to assure the balanced development of the six main fields of science (agriculture science, natural science, engineering and technology, medical and health sciences, social sciences and humanities). The engineering and technology takes the biggest share of the budget, approximately 30%. The structural challenges identified in the previous chapter have not been tackled in systematic way and formulated as national research priorities or special programmes.

Instead, some topics like basic economic deficiencies, technological capabilities of companies, etc. are regular subjects of individual research projects.

In the context of economic development, the policy debates related to innovation and science have been scarce. However, in January 2010, the BiH State Unit for Economic Policy Planning has published a document titled „Development Strategy 2008-2013” which focuses on six strategic areas: macroeconomic stability, competitiveness, employment, sustainable growth, EU integration and social inclusion. These objectives have been defined by taking over the objectives of all relevant strategies, objectives defined in EU accession and unaccomplished objectives from the previous development strategy (BiH MID Term Development Strategy 2003-2008). In the segment of competitiveness, considerable attention is given to the importance of R&D. This is an indication that governmental authorities are becoming aware of the importance of these activities for the future of the country’s socio-economic development.

The research policy in 2010 and 2011 is focused on participation of the BiH scientific organisations in ERA, especially Framework Programme and the mobility of researchers and students. The conditions for the mobility of researchers in BiH were improved in 2011 when BiH EURAXESS portal was set up.

Ministry of Civil Affairs (MoCA) has been supporting innovators since 2007 under the “Support for Innovation and Technical Culture in BiH” programme. Funds are allocated through public competition. In 2010, a total of €0.76m was allocated. RS also allocates budget funds for technological development, which includes innovators, meetings and projects for the development of new technologies and the information society. The total budget for 2010 was €0.41m broken-down as follows: public call to innovators (€0.06m or 6.3% of the total budget), development of new technologies (€0.30m or 86.3% of the total budget) and development of the information society (€0.05m or 7.4% of the total budget). The Federation Ministry of Education and Science have also been supporting innovators, innovativeness and technical culture, and the introduction and development of new technologies. Support is implemented through a public call. In the course of 2010, €0.37m was allocated for these purposes.

The current fiscal policy instruments in BiH still do not provide tax incentives for R&D. Zero percent corporate tax applied on all profits that are re-invested into the development of the company is not yet law in the country. The Law on Corporate Tax in RS (Official Gazette of RS 91/06) and the Law on Corporate Tax in FBiH, (Official Gazette of FBiH 97/07 and 14/08) only foresee incentives to those companies, which reinvest into the production part of their activities. Most of the research institutions, as a part of the university structure, are public institutions and they are entitled to some tax exemptions like all other public and not-for-profit organisations, but there is nothing to support R&D specifically. The only incentives that may indirectly support R&D are exemptions from custom duties and VAT refunds. According to the Law on Custom Duties (Official Gazette BiH, no. 57/04), imports of equipment financed by an international donor organisation are exempted from customs duties. The relevant Ministry in Republic of Srpska (RS), Federation of BiH (FBiH) or canton issue certificates for the import of donated equipment for higher education institutions. These certificates are used to claim the exemption from customs duty and the same applies for the value added tax refund. For value added tax, the tax refund has been in force since 2005 (Official Gazette BiH, no. 09/05). Equipment that has been procured in BiH or abroad for higher education institutions is entitled to the tax refund. A major problem in regard to

fiscal policies is that no clear incentives that support research in BiH have been created yet. This problem needs to be addressed and a comprehensive solution should be found. The evaluation culture in BiH science and research system is weak. All kinds of evaluation usually serve the administrative purposes of the responsible ministries. The tradition of evaluation is mainly evident in the evaluation of research projects financed through the support measures “Programme for scientific and research activities” at the entity level. These programmes are the basic instruments of the responsible entity ministries for financing research activities through competition-based research grants. The evaluation of projects includes ex-post evaluation. Ex-post evaluations are mainly targeted at the achievement of project results. There is a lack of systematic and comprehensive evaluation of the research supporting programmes administered by the relevant entity ministries. So far, the ministries publish the information on the number of submitted and selected projects as well as the budget spent in the given call. Since comprehensive and performance-based evaluation is absent, it has no significant impact on science policy.

3.2. Trends in R&D funding

Table 1: Basic indicators for R&D investments in Bosnia and Herzegovina¹⁶

	2008	2009	2010	EU average 2010
GDP growth rate	5.7	-2.9	0.7	2,0
GERD as % of GDP	N/A	N/A	N/A	2,0
GERD per capita	N/A	N/A	N/A	490.2
GBAORD (€ million)	N/A	N/A	N/A	92,729.05
GBAORD as % of GDP	N/A	N/A	N/A	0.76
BERD (€ million)	N/A	N/A	N/A	151,125.56
BERD as % of GDP	N/A	N/A	N/A	1.23
GERD financed by abroad as % of total GERD	N/A	N/A	N/A	N/A ¹⁷
R&D performed by HEIs (% of GERD)	N/A	N/A	N/A	24.2

¹⁶ There are three statistical institutes within the Bosnia and Herzegovina. According to the law on statistics, the competent authorities for organising, producing and disseminating statistics are: [the Agency for statistics of Bosnia and Herzegovina](#) at the level of the state, [the Federal Office of Statistics](#) for the Entity of Federation of Bosnia Herzegovina and [the Republika Srpska Institute of Statistics](#) for the Entity of Republika Srpska.

The Agency for Statistics of BiH is responsible at national level to collect, process and distribute R&D statistical data in accordance with internationally recognised standards, on the basis of the data provided by the entity institutes for statistics and the data the Agency collects directly. At present, no R&D data is collected by the Agency for Statistics of BiH. At the entity level, the institutes for statistics of Federation of BiH provide no data for this part of the country. It is only the Institute of Statistics of Republic of Srpska, who provides the data since 2010 but only for Republic of Srpska..

It was this fact alone the report had not been able to provide national R&D estimates since no data is collected from all parts of the country.

¹⁷ 8.4 (2009), 9.04 (2005)

	2008	2009	2010	EU average 2010
R&D performed by PROs (% of GERD)	N/A	N/A	N/A	13.2
R&D performed by Business Enterprise sector (as % of GERD)	N/A	N/A	N/A	61.5

Prior to the disintegration of former Yugoslavia in 1990s, the BiH research system was thriving. Investments in science and research were as high as 1.5% of GDP and industry played a significant role with important industrial companies that had created and developed large research laboratories with several hundred researchers (UNESCO, 2006).

Investment in research is now very limited. Statistics on research and development activities are lacking. No data exist on business, foreign and private non-profit funding. The entities and cantons fund their particular policies through their own budgets.

In the absence of overall statistics for research and development (R&D) activities in BiH, it is difficult to come up with an exact evaluation of public investment in such activities. According to the [Strategy Development for Science in BiH 2010-2015](#), BiH invests around 0.07% of its GDP on R&D however, it is estimated that, in fact, total investment is as high as 0.1 to 0.14% which, however, is still far below the EU 27 average of 2.01% in 2009.

There are three main funders in BiH which allocates financial resources via competition-based research grants: at the State level, the Ministry of Civil Affairs of BiH, the Ministry of Science and Technology of RS and the Ministry of Education and Science of FBiH at the entity level.

The total budget of public funding for research in Bosnia and Herzegovina by the state, entities and cantonal governments was likely to amount to almost €9.86m in 2010. This figure is composed of the following main items:

- At the State level, Ministry of Civil Affairs through its Department for Science and Culture had a budget of €76,000¹⁸ in 2010 for grants that support innovation and technical culture in BiH and €255,000 EUR to support research projects and researchers for the activities related to FP7 specific programmes and themes,.
- In RS, the financial allocation in 2010 was in total €2m (actual expenditure) channelled through the “Programme for scientific and research activities” while budget for innovation and technology was €0.41m¹⁹.
- The total budget for research of the Federal Ministry of Education and Science in 2010 was €1.6m channelled through the “Programme for scientific and research activities”. The financial cost in support of innovation and technology in 2010 was €0.37m.

There are no other public authorities that finance research out of their own funds.

The lack of financial resources in the national budget drives the researchers to look for funding sources outside the country. Thus, the research community in BiH turn more and more toward opportunities provided by the EU’s FP7 and EUREKA/COST. The membership or associated status will not result in automatic benefits, the opportunity must be capitalised on.

¹⁸ Public call, 2010 grants within the Programme «Support for technical culture and innovations in BiH», www.mcp.gov.ba

¹⁹ Draft, Science and Technological development Strategy of RS 2011 – 2016 available at: <http://www.vladars.net/sr-SP-Cyrl/Vlada/Ministarstva/mnk/PAO/Strategije/Pages/default.aspx>

Regarding the participation under the EU FP7 programme and assessment of possibilities offered by the programme, by June 2011 institutions from BiH participated in 217 project applications, which were submitted following the calls for applications within FP7. Out of this number, 27 projects in which institutions from BiH participate were approved in the period from the launching of FP7 programme to June 2011.

Research institutions from BiH participate in 16 actions of the programme COST (Cooperation in Science and Technology) and two EUREKA programme projects.

Preparation of another two applications is underway.

BiH is not eligible for the EU Structural Funds that play an important role for co-funding R&D in Europe.

Public-private partnerships still have no significant effect on innovation funding in BiH. However, this form of financing is gradually becoming the first choice infrastructure financing (e.g. science/technology parks in Mostar, Banja Luka and Zenica established in 2010), and is expected to gain importance in innovation financing also.

3.3. Evolution and analysis of the policy mixes

It is hard to distinguish a policy mix for research in BiH. Most of the documents guiding research, innovation and other policies affecting research have been adopted only in the past two years, usually with no coordination between them. The bulk of these strategic papers have not yet been translated into specific policy actions, which hampers efforts to distinguish a policy mix in practice. The main reason for the slow implementation of most research-related strategies is the lack of sufficient and thematically coherent financing to underpin them.

Although there are no strategic measures and policies for innovation and technology targeted investments, some efforts have recently been made. In 2008 the Government of the Federation of BiH adopted the strategy for Information on Development and Limitations in Establishment and Work of Science Parks in the Federation of BiH. A technology park was established in Mostar in 2008. The Science Park Tuzla and Technology Park Mostar are operating in Federation of BiH (FBiH) as limited liability companies, while the Technology Park in Zenica is in the last phase of establishment. The Government has emphasised the importance of science and technology parks as instruments for the integration of different socio-economic and political actors. It also adopted a conclusion that the Ministry of Development, Entrepreneurship and Crafts and the Ministry of Education and Science in FBiH continue their efforts to establish science and technology parks. The law on science and research activity of the Republic of Srpska (RS) defines the procedure for establishing science and technology parks and defines their goals. In RS an innovation centre was established in Banja Luka in 2010. Unfortunately, the effects of these measures on innovation and socio-economic development remains modest probably due to the overall framework conditions which do not favour research and innovation for development and growth as well as very little investments. Besides, the aforementioned three structural challenges (see Chapter 2) that hinder innovation are not adequately addressed within the policy mix.

If we take into account the Self- assessment tool of the Innovation Union Flagship initiative (EC, 2010) that consists of the ten features for well functioning of the national innovation system, the performing of the BiH science system is unsatisfactory.

Research and innovation are not considered as a key driver of competitiveness and job creation, rather they are not treated as other priorities such as budget deficits, wage insurance and pensions, European integration, agricultural policy, fight against

corruption, etc. The policy debates about the role of innovation are underestimated in policy circles and often restricted to academic and professional communities. This is due to the low awareness of political and business elites about the critical role of innovation and insufficient communication among key innovation stakeholders about knowledge-based strategic development and visions. Many administrative burdens and pointless regulation hinder innovation in the companies.

3.4. Assessment of the policy mix

So far, only international institutions have created several financial instruments fostering innovation and development in the country. In the report “Innovation Infrastructures: Bosnia and Herzegovina” published by the wbc-inco.net in July 2011, the following programmes and instruments were reported²⁰:

“The Business Innovation Programme” (BIP) is a non-profit foundation established in Norway in 1993. Its objective is to contribute to the establishment of jobs and facilitate the development of expertise in the field of economic development as an effective means of building or rebuilding countries. The project Student Enterprises and Young Entrepreneurship aims at establishing student enterprises and entrepreneurship training in Bosnia and Herzegovina.

Competitive Regional Economic Development (CREDO): The main objective of the programme is to enhance the development of SMEs and the growth of Bosnia and Herzegovina private sector, as well as to reduce the high unemployment rate as a leading cause of poverty. BH Office of SIDA (Swedish International Development Cooperation Agency) developed a model of work with regional development agencies in 2003. The programme has been extended for period 2010-2014. The main objective of this new project is to increase competitiveness and growth of SMEs in the selected sectors.

Enhancing Small and Medium Enterprise (SME) Access to Finance Project of the World Bank: In 2009 the World Bank pledged a \$70m line of credit for SMEs. The essence of this project is to improve access to finance for Small and Medium Enterprises (SMEs) in the context of the global financial crisis. The project will support the country’s banking system to respond to the needs of SMEs as important generators of economic growth and employment.

Open Regional Fund for Foreign Trade Promotion in South- East Europe (ORF): The Open Regional Fund (ORF) is financed by German Federal Ministry for Economic Cooperation and Development (BMZ) and implemented by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ). The project was established in January 2007 for a period of five years. The aim of the project is to strengthen competitiveness through multi-country cooperation among companies and institutions in the region and marketing of South East Europe as an economic area on the international stage. Eligible countries are Albania, Bosnia and Herzegovina, Croatia, Macedonia, Montenegro, Serbia and Kosovo.

Turn-around Management and Business Advisory Services Programme BiH (TAM/BAS): The new European Bank for Reconstruction and Development (EBRD) Strategy (2010 – 2013) ensures that the Turn-around Management and Business Advisory Services (TAM/BAS) programmes continue to provide advisory services to SMEs in BiH. TAM/BAS aims to reduce the “brain drain” on human resources by implementing

²⁰ Report on the mapping of the WBC Innovation infrastructures: Bosnia and Herzegovina, available at: <http://www.wbc-inco.net>

programmes that target young entrepreneurship and innovation development. The programmes are often technology related.

TAM Programme

TAM is piloting low-cost incubator projects. As a practical approach for creating new jobs, through business formation and expansion, business incubators have become recognised worldwide as a viable tool for economic development. In particular, TAM has been incubating ICT enterprises by carrying out small TAM projects with individual entrepreneurs. This initiative aims to help local entrepreneurs in the ICT field to create commercially viable and competitive businesses. This will also contribute to the creation of jobs, and the development of a dynamic ICT industry.

BAS Programme

The BAS Programme, administered by the European Bank for Reconstruction and Development (EBRD), has been established in order to assist the development of small and medium sized enterprises. Objectives of the BAS Programme are:

- To assist SME BiH enterprises by financially supporting business advice and activities to benefit from the best local consultants; and
- To develop and strengthen the skills and quality of local consultants and cooperating with those institutions which promote the development of SMEs in BiH (industry associations, chambers of commerce, entrepreneurs representative groups, etc.). Areas of the BAS Programme support are: market research; business partner and investor search; selecting and appraising equipment to be purchased; improving organisational and business management structure; preparing business plans; developing and improving financial accounting and control systems; developing and upgrading management information systems; preparation and certification for quality management systems.

The USAID-Sida FIRMA Project has launched an initiative to develop an Innovation Business Network (IBN) in Bosnia and Herzegovina to improve and support innovation in small and medium-sized enterprises (SMEs). This new local network is linked to the European Business and Innovation Centre Network (EBN), which was established by the European Commission and has more than 200 members from Europe and beyond.

The USAID-Sida FIRMA Project – sponsored by the US and Swedish governments through their international development agencies, USAID and Sida – is a five-year project supporting sustainable economic growth, employment expansion and increased household incomes in BiH. The FIRMA Project focuses on three sectors of the economy – wood processing, tourism and metal processing.

As far as local support measures are concerned, Ministry of Civil Affairs (MoCA) has been supporting innovators since 2007 under the “Support for Innovation and Technical Culture in BiH” programme. Funds are allocated through public competition. In 2010, a total of €0.76m was allocated. RS also allocates budget funds for technological development, which includes innovators, meetings and projects for the development of new technologies and the information society. The total budget for 2010 was €0.41m broken-down as follows: public call to innovators (€0.06m or 6.3% of the total budget), development of new technologies (€0.30m or 86.3% of the total budget) and development of the information society (€0.05m or 7.4% of the total budget). The Federation Ministry of Education and Science have also been supporting innovators, innovativeness and technical culture, and the introduction and development of new technologies. Support is implemented through a public call. In the course of 2010, €0.37m was allocated for these purposes.

Under IPA National Programme, the activities to strengthen capacities and to purchase equipment for three research and innovation centres (in Banja Luka, Mostar and Zenica) were supported in amount of €1.3m.

Under Multi-Beneficiary IPA programme and with the support of the Government of Flanders, the Ministry of Civil Affairs implemented the project Triple Helix – partnership of scientific community, economy and public administration. Project implementation was carried out in cooperation with OECD within the Regional Competitiveness Initiative. The objective of the project was to establish a model of cooperation between scientific institutions, economy and public administration by promoting innovatory ideas to be applied for the development of economy and by encouraging economic entities to invest in research and innovatory ideas. The model of cooperation established through the Triple Helix pilot project in the Food sector can be applied to other sectors of economy. The project ensured cooperation between the ministries in charge of research, chambers of commerce and universities. Budget of the project was €0.5m.

Table 2: Assessment of policies addressing structural challenges

Challenges	Policy measures/actions ²¹	Assessment in terms of appropriateness, efficiency and effectiveness
Weak domestic demand for R&D	Strategy development of Science in BiH2010-2015	A decreasing demand for R&D accompanied by a growing number of tertiary graduates (number graduated students increased from 6039 (BiH Agency for Statistics, 2011) in 2003 to 18177 (BiH Agency for Statistics, 2011) in 2010) suggests that BiH economy is facing significant structural changes in terms of the demand for knowledge. Once very focused on R&D, demand for knowledge is becoming non R&D based. As in other countries of Western Balkan at a similar level of development, R&D system in BiH is dominated by the government and the higher education sector.
Weak private sector	Strategy development of Science in BiH2010-2015	Low levels of the technology, the innovative and absorptive capabilities of the companies as well as their financial restrictions
Knowledge and Technology transfer	Strategy development of Science in BiH2010-2015	The local demand for R&D and innovation is constrained both by weak universities and also by weak business sector.

4. National policy and the European perspective

The European Research Area (ERA) is addressed in BiH research policy mostly by encouraging and supporting BiH research organisations to participate in the projects within the ERA. The primary concern of BiH research policy is to intensify the access to international scientific networks and knowledge transfer and exchange. In that respect, the integration of the BiH research system into the ERA is one of the priorities in the area of international cooperation and as such is actively supported by the Ministry of Civil Affairs (MoCA) and especially its Department for Science and Culture. The active participation of researchers in the ERA is a priority in the Strategy for the Development of Science 2010-2015.

²¹ Changes in the legislation and other initiatives not necessarily related with funding are also included.

More efforts need to be taken in order to address the strategic challenges outlined above and achieve further alignment with the ERA. Some of the key challenges include increasing inward and outward mobility of researchers, increasing the proportion of researchers in the private sector, developing research infrastructures and securing their efficient utilisation, reforming research and higher education (through improved funding mechanisms, quality assurance, and accountability), developing science - industry collaboration and internationalisation.

Please add more comments and brief evaluations on the national policies in relation to ERA objectives (e.g. discoordination, weak strategies etc., you have already mentioned in the report).

Table 3: Assessment of the national policies/measures supporting the strategic ERA objectives (derived from ERA 2020 Vision)

	ERA dimension	Main challenges at national level	Recent policy changes
1	Labour Market for Researchers	(-) Overall highly unattractive working conditions for researchers. (-) Stopping or slowing down brain drain by tertiary students and young researchers.	Policy attention is focusing on the reinvestment in scientific and technological research and on programme to train Ph.D. students.
2	Cross-border cooperation	(-) BiH national programmes are closed to foreign participants. (-) Low mobility within the Western Balkan region	Bilateral R&D cooperation agreement intensified with countries from the region, most notably with Slovenia. No changes in design of national programmes; these remain closed for foreign participants.
3	World class research infrastructures	(-) No country research infrastructure (RI) planning. (-) BiH is not a member of the European Strategy Forum on Research Infrastructures (ESFRI).	Strengthen and enhance participation of BiH in ESFRI initiatives
4	Research institutions	(-) High numbers of HEIs, but no HEI accounts for World class research	The establishment of the research institute within the University, Integrating science and education, and promotion research.
5	Public-private partnerships	(-) Third mission not yet a high priority for BiH universities	Strategy for Development of Science in BiH 2010-2015 promotes the stimulation of research and development cooperation between scientific and research institutions and companies.

	ERA dimension	Main challenges at national level	Recent policy changes
6	Knowledge circulation across Europe	(-) BiH has low participation rates in European research initiatives.	Participation of BiH in the EU mobility programmes such as Marie Curie-People, EURAXESS.
7	International Cooperation	(-) Moderate participation in the FP, EUREKA and COST programme. (-) Overall, very low resources provided for international co-operation in science and technology.	Ministry of Civil Affairs of BiH continues supporting preparation of projects proposals within the FP, COST and EUREKA programmes.

Annex: Alignment of national policies with ERA pillars / objectives

1. *Ensure an adequate supply of human resources for research and an open, attractive and competitive single European labour market for male and female researchers*

1.1 Supply of human resources for research

Human resources in BiH were severely affected by the break up of former Yugoslavia. War and economic crises adversely affected the human resources and R&D potential. The so called 'brain drain' resulted in the loss of experts who left to seek new employment opportunities abroad and the 'brain waste' saw scientists leaving R&D for better paid jobs in the private or informal sector. R&D jobs continue to be unattractive because of low pay, lack of social status, limited incentives and poor employment opportunities. Thus, BiH suffered the departure of its most expert and highly qualified young people, which is now resulting in a shortage of experienced middle-aged researchers. Despite the fact that donor assistance to BiH will remain very important in the medium term, BiH is not entitled to participate in the EU programmes currently reserved for candidate countries such as the European Investment Bank's Innovation 2000 Initiative. The resources for funding longer-term research or researcher mobility are almost non-existent. Donor aid is often short term, interested in investing in certain key areas, such as S&T infrastructure and modernisation of laboratories, is small. There is an urgent need to better match financial assistance from donors with the national priorities of BiH.

[Statistical Institute of RS](#) regularly publish bulletins for education sector. According to the most recent published data, the total number of academic staff that works at the Universities in RS is 2,724²². Out of the total 50% are PhD holders and 15% Master degree holders. There is 1,423 permanent (58%) and 1,033 (42%) part time staff. The total number of master and PhD holders as well as specialists year by year increases. There are 65 PhD and 256 MA holders obtained their degrees in 2010²³. According to the rough estimation of the Ministry of Science and Technology of RS, there are 1.2 researchers per thousand active populations.

[Federal Office of Statistics](#) in its publication "[Higher Education in FBiH 2009/2010](#)" reports 100 PhD and 462 Master degree graduated students in the academic year 2009/2010. There are 2,716 FTE teaching staff and 3,016 part time staff (¹Federal Office of Statistics, 2010). The universities integrate the teaching and the scientific process with the view of training staff, producing young scientists and developing research, which results in new knowledge and scientific methods. Scientific and research activity in BiH has been dominantly conducted at the universities. Unfortunately, due to various circumstances, primarily lack of financial resources, during the last 15 years the intensity of scientific and research process has been significantly reduced. Since 2003, BiH universities have been engaged in the Bologna Process implementation at the level of undergraduate studies. The first steps have been made with the view of recognizing the scientific and research work in the form of financial support to scientific development, publishing of works in refereed journals and participation in scientific meetings. However, master and doctoral studies programmes were frequently developed without any fundamental analysis of the infrastructure and human resources potentials and long-term formation of the scientific and research process, without which these programmes are inconceivable in the modern world. The needed support of the state in form of a clear policy and financial support in this area was missing as well.

As far as BiH is concerned, there is an absolute urgency to reinvest in scientific and technological research. Launching an ambitious programme to train PhD students and thereby to educate the young generation of scientists, and to build up the country's research infrastructures are the two most urgent tasks for which state funding, complemented by international funds, is necessary.

²² Statistical Bulletin-Higher Education no.8, RS Institute of Statistics, Banja Luka, 2011

²³ Ibid

1.2 Ensure that researchers across the EU benefit from open recruitment, adequate training, attractive career prospects and working conditions and barriers to cross-border mobility are removed

Employees in public sector are considered as civil servants. Their remuneration is regulated by the official salary schemes set in accordance with the regulations on labour and employment, as well as collective agreements and general acts of employers. These are based on education level, type of jobs and length of work experience. Salaries are determined by the amount of funds provided from the state budget. The BiH as well as entity government decided to cut the budget deficit in 2011. Salaries for the Universities may drop in real terms. Salaries are below the average of most EU countries, which significantly reduces the demand for inflow of researchers in the country. The faculties can introduce additional stimulus in addition to the monthly salaries due to the scholarships.

Public research organisations and higher education institutions in BiH so far have not signed the Declaration of Commitment to the Principles of the European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers in accordance with the regulations on labour and employment, as well as collective agreements and general acts of employers, foreigners employed in domestic legal entities and natural persons have the same rights, obligations and responsibilities under labour and employment of nationals, unless the international agreement provides otherwise.

Foreigners must also meet the specific requirement to have a work permit for a contract of employment issued of the respective authority:

- 1) work permit is a permit for a foreigner's paid work.
- 2) work permit to conclude a contract with a foreigner, at the request of an employer who employs him, shall issue in the form of a decision by the competent branch office of the employer, based on the quota of work permits in the Republic of Srpska.
- 3) annual quota determined by the respective authority.
- 4) Work permits are issued by quota determined from the first to extend work permits issued, and then for new employment.

Mobility of researchers and academic staff is within the competence of the responsible ministry for science in the FBiH, RS and cantons. The responsible ministry supports mobility of researchers through the implementation of bilateral agreements. Academically oriented programmes that support mobility of researchers are managed via university offices for international relations. These programmes include: CEEPUS, TEMPUS and Erasmus Mundus External Cooperation Window.

Apart from the abovementioned, BiH academic community signed numerous bilateral agreements on international cooperation with foreign institutions (mutual agreements between faculties/colleges, universities, institutes etc.) that also cover the field of science and research, as well as joint projects. This type of cooperation agreements mainly is reflected in individual participation of BiH researchers in research activities. The biggest involvement in this segment is visible in biomedical and technical sciences.

In May 2010, in BiH started the project titled "Development of Network Mobility Centres in Bosnia and Herzegovina (BAMONET)". The aim of this three years project is to develop a network of Mobility Centres in line with EURAXESS initiative, which will offer quality and consistent services and support for mobile researchers, as well as personalized assistance. The project is supported by the European Commission within the FP7 "PEOPLE" programme area and main project objectives are:

- to establish structured network of service and information providers, enabling practical assistance to researchers in all issues related to their experience of mobility;
- to develop organisational framework for providing of best performance in information and services delivery, and
- to promote EURAXESS values through the BiH researchers' mobility portal, linked to pan- European Mobility Portal.

The project participants are the Ministry of Civil Affairs (project coordinator), University of Banja Luka ("Bridgehead", partner) and the University of Sarajevo (partner).

The conditions for the mobility of researchers in BiH were improved in 2011 when BiH EURAXESS portal was set up. Steps have been taken to raise awareness of the mobility of researchers. First “Researcher’s Mobility Day in BiH” was held on May 27th 2011, at the University of Banja Luka. The event was organised in the scope of BAMONET Project (BiH Researchers’ Mobility Network). As part of this event it was organized round table on “Problems of Researcher’s Mobility” that gathered representatives of EURAXESS centres from BiH, Croatia, Serbia, Montenegro and FYR Macedonia and representatives of academic community. Basic problems connected with mobility of researchers in the Western Balkan countries were discussed.

Participants from the regional EURAXESS centres stressed problems and obstacles in researchers’ mobility from BiH to other countries and within BiH itself. Some of them are following: lack of classes in foreign languages, regulation of absence status in order to achieve mobility, coordination of legislation at national level with regard to doctoral studies, etc. It was also emphasized importance of regional initiatives at the field of scientific researches and regional projects, and significance of relations with scientific researchers at the Western Balkan countries such as efforts in promotion of FP7 PEOPLE program (Maria Curie scheme), from where could be financed regional mobility (for example, leave of BiH researchers to Croatia, Serbia or some other regional country and vice verse).

1.3 Improve young people's scientific education and increase interest in research careers

The first round of development of new degree programs (Masters and PhD) started before development of the necessary quality cultures existed at the universities. The restructuring of the old university degree programmes in two cycles begun without the necessary preparation and with lack of appropriate understanding of the logic and philosophy of Bologna principles. As a result, instead of developing new type of programmes, the old one were compressed with no appropriate use of the ECTS system, lack of the clear defined learning outcomes, not to say about the newly appeared needs for development of appropriate skills, competency and finally practical employability of the graduates.

The problem for the establishment of the PhD study programmes is the lack of appropriate research facilities. The HEIs are at the initial stage of development of doctoral programmes and they rely to a great extent on external support channelled through various individual and joint international projects such as TEMPUS program, Erasmus Mundus.

Guidelines for the development of the Code of Rules for the Doctoral Studies have been adopted in Republika Srpska. The Guidelines give basic principles for the organisation of studies: up to 45 ECTS for taught courses and at least 135 ECTS for independent and original scientific research.

There are few doctoral programmes in BiH established by the BiH and EU universities financed by the TEMPUS programme where medium of instruction is English. Also, there is a PhD student mobility financed through programme such as Erasmus Mundus and Erasmus Mundus External Cooperation Window.

Lack of students in BiH, especially in natural science and mathematics as well as technical science represents a negative trend in development of human resources in STI. Statistical Office of FBiH, reports that in 2009/2010 academic year there were 100 PhD graduates out of which 2 in natural science, mathematics and computing, 19 in engineering and technology. In 2010 in RS, Statistical office of RS reports 4 PhD graduates in natural science including mathematics and 10 in technology and engineering²⁴.

The main barrier hindering the development of doctoral programmes is very limited coordination in the governance of higher education at any level between the entities or among cantons. It contributes negatively to the initiation of reforms in doctoral programmes since no general principles of coordination are agreed between the different levels. Twelve different higher education systems (10 cantons, one district and one republic) co-exist, with some degree of cooperation, but not enough to implement a homogeneous national reform of the organisation of doctoral programmes.

Barriers linked directly to higher education and research, some of the difficulties are as follows:

- The first difficulty is the limited level of research in the country that has a direct impact on the content and on the quality of doctoral research. Before the war, research was strongly linked to important industrial capacities, which were damaged during the war.
- The second difficulty relates to a governance issue caused by the institutional autonomy of

²⁴ Statistical Bulletin-Higher Education no.8, RS Institute of Statistics, Banja Luka, 2011

universities and faculties. Many universities are made up of an association of strongly independent faculties, which manage their own finances. This prevents university-based planning and management, weakens the capacity for reform and inhibits the external relations of HEIs.

- Finally, the lack of internationalisation and international cooperation in universities is also a problem. Insufficient knowledge of foreign languages contributes to a failure to move things forward.

The country has a limited participation to FP7. Improvements in research through participation in international research projects could be one of the main challenges to improve the situation.

At doctoral level, barriers are as follows:

- The lack of specific funding for doctoral programmes and doctoral students. These funding problems apply to the R&D sector and to the higher education system in general.
- Secondly, a shortage of appropriate and up-to-date equipment in certain fields.
- Thirdly, Bosnia and Herzegovina also suffers from a shortage of suitable academic staff for doctoral programmes.

In addition, an important challenge is therefore the need for interdisciplinary in the organisation of doctoral programmes, as well as the development of interuniversity cooperation, since small universities (setting apart the University of Sarajevo) do not have the capacity to organise comprehensive and internationally recognized doctoral programmes of their own. Attention has to be brought to the need for the involvement of industry in research and doctoral programmes as an important feature in the modernisation of doctoral programmes. Indeed, however, as things stand, there are not yet enough strong industries or enterprises in a position to provide either grants for doctoral research projects or research projects with connections to doctoral study programmes.

1.4 Promote equal treatment for women and men in research

Promotion of women in science is not specifically articulated in the policy formulation. Specific arrangements exist for young researchers in case of maternity leave, where their status can be extended for the period of their absence from work. It applies also for women working at higher education: their status is maintained and the leave does not count into reflection time frame. There are no national policy level regulations, which would in any way discriminate researchers on the basis of gender.

2. Facilitate cross-border cooperation, enhance merit-based competition and increase European coordination and integration of research funding²⁵

In BiH there are no instruments particularly targeting researchers from third countries. The Science Law on Entity and Cantonal level in theory enables participation by foreign researchers in BiH research programmes, but there is little experience with this issue, due to limited interest by foreign researchers in working in BiH. Low salary and poor R&D equipment are major barriers for attractiveness of research careers in BiH both by the BiH and foreign nationals.

Concerning the scientific and educational cooperation with other countries from the region as well as with other European countries, it can be said that Bosnia and Herzegovina only have an active on going bilateral programme in scientific research with Slovenia and Montenegro. All other forms of activities (joint workshops, conferences, scholarships, student exchanges) within the bilateral cooperation are focused on education and that mostly on the basis of direct inter institutional agreements.

BiH academic community signed numerous bilateral agreements on international cooperation with foreign institutions (mutual agreements between faculties/colleges, universities, institutes etc.) that also cover the

²⁵ Promote more critical mass and more strategic, focussed, efficient and effective European research via improved cooperation and coordination between public research funding authorities across Europe, including joint programming, jointly funded activities and common foresight.

- Ensure the development of research systems and programmes across the Union in a more simple and coherent manner.
- Promote increased European-wide competition and access of cross-border projects to national projects funding

field of science and research, as well as joint projects. This type of cooperation agreements mainly is reflected in individual participation of BiH researchers in research activities. The biggest involvement in this segment is visible in biomedical and technical sciences.

The Cooperation Agreement between BiH and Slovenia on promotion of cooperation activities in the areas of science and technology is an example of successful bilateral activities. The programme launches every two years competitive grants for co-financing of joint research projects. Project criteria are: importance of research results for economic and social development of BiH, scientific value and/or research applicability, potential opportunities for participation in EU research projects, use of the research results for commercial purposes. On average, every year, 20 to 30 projects apply to these Calls. Joint Committee for Scientific and Technology Cooperation between BiH and Slovenia evaluates the projects and proposes the best ones for financing.

The Joint Committee for Scientific and Technological Cooperation between Slovenia and BiH has recently approved 28 projects, which will be implemented between 1 January 2012 and 31 December 2013.

57 projects were submitted to the open competition in 2012 and 2013 to select the proposals of scientific and research projects within the scientific cooperation between Slovenia and Bosnia and Herzegovina. The Joint Committee for Scientific and Technological Cooperation between Slovenia and BiH agreed at its 9th session, held in Ljubljana on 8 November 2011, that the next open competition for 2014 – 2015 will be announced on 15 February 2013 at the latest.

BiH participates in the FP7 (Capacities) [WBC.INCO-NET](#) project, a regional consortium project with the aim of supporting research and innovation cooperation and enhanced integration of the Western Balkan Countries (WBCs) in the ERA.

3. Develop world-class research infrastructures (including e-infrastructures) and ensure access to them

BiH does not participate in the ESFRI programme while the national strategic roadmap for research infrastructure has not been made yet.

The research infrastructure is primarily national in character. The public research (technological) organisation and the higher education institutions have a large autonomy within the Universities in BiH, with significant fragmentation of resources including present research infrastructure and equipment. As a result of this process, small research units with research infrastructure tools dominate. In such situation, duplication of equipment and unnecessary waste of already scarce resources is eminent. To avoid and enable networking and integration, the Register of equipment should be established which still is not the case.

4. Strengthen research institutions, including notably universities

As it is the case with R&D, the authority over higher education is given to the two entities: the Federation of Bosnia and Herzegovina (FBiH) and Republika Srpska (RS). At the State level no ministry is in charge of higher education. In RS a single ministry of education manages the educational sector, including higher education.

There are two Universities in RS: the University of Banja Luka and the University of East Sarajevo with 45,966 enrolled students in academic year 2010/2011²⁶. There were in total 7,328 graduated students in 2010. Out of these, 5,651 graduated in social science, 658 in technical science and technology, 531 in medicine, 110 natural science, 219 biomedical and 159 humanities²⁷. In the FBiH, the Federal Ministry of Education has transferred the authority of education to the ten cantons, so that each canton has its own ministry of education, which is also in charge of higher education. Out of 10 only 5 cantons have universities and these are: Sarajevo, Tuzla, Bihac, Zenica and two universities of Mostar (University "Džemal Bijedić" Mostar, and University of Mostar) with 71,610 enrolled students in 2009/2010 academic years (Federal Office of Statistics²⁰¹⁰). There were in total 10,096 graduated students out of which 100 PhD and 462 Masters (Federal Office of Statistics²⁰¹⁰). Four universities in BiH make loose associations

²⁶Statistical Bulletin-Higher Education no.8, RS Institute of Statistics, Banja Luka, 2011

²⁷Ibid

of autonomous faculties and other institutions (Sarajevo, Bihac, University “Dzemal Bijedic” Mostar and University of Mostar) and the other four are integrated universities, where in total there are 140 faculties and 10 academies²⁸. The public universities are the main beneficiaries of research funding given through the competitive grants by the various competent ministries at the entity and canton level. As far as research institutes are concerned there are 21 in RS (15 public and 6 private) and around 30 in FBiH (20 public and 10 private)²⁹.

BiH has made, on one hand, the progress towards the reform process of higher education by defining broader common policy framework at the country level (Framework law on higher education in Bosnia and Herzegovina Official Gazette of BH No. 59/07), establishing common standards for the recognition or accreditation of the universities through the Agency for Development of Higher Education and Quality Assurance and the mechanisms for the mutual validation of the university diplomas through the Centre for Information and Recognition of Documents.

Teaching activity across the BiH universities also appears to be in a rather critical position. Despite a much more favourable staff/student ratio than in most other European countries, BiH university teachers feel overloaded with lectures while having little time for research. However, the reality is that, in at least one of the BiH universities, the minimum obligatory teaching load for full time staff is three hours per week only. The overloading of teachers – especially those above certain seniority - coming from the fact that they teach simultaneously in other faculties of the same university or at a different universities, is drawing several salaries. Indeed, all universities rely extensively on these visiting professors, which is an expensive habit, all the more so as it results in a low research output. OECD norm (OECD/GD (07) 84 Frascatti Manual) defines that each university teacher should spend half of his/her working hours in education process (so called. 0.5 FTE Full Time Equivalent) and other half (0.5 FTE) as researcher. This condition has been met with around 3% of university teachers in BiH³⁰.

While each university has an official mission and vision, there is an urgent need for these to be articulated more clearly and to have greater influence on both the long-term strategy and the daily work of the institutions. Given the current large numbers of students, the resources available to each university, and the wider social and economic situation, it appears that the universities should concentrate their efforts on education. In parallel, a more realistic approach to research could be developed by fostering centres of excellence, in academic fields central to each university's profile, for the application and transfer of technology and up-to-date international scientific knowledge relevant to BiH social development. The necessary resources – including financial and human resources – are not currently available for more ambitious research operations.

Having in mind that public funding of research at the BiH universities is very low and that universities are focused on teaching activities, it is still early to speak about the national university landscape in terms of the broader autonomy in research, in the management of research budgets, on hiring personnel, on the capacity to autonomously design research agendas and topics of research specialisation.

In terms of broadening the universities' scientific and academic base and reversing the terrible brain drain of the last decade, only a few Universities appears to have put in place a concrete strategy for its postgraduate students to obtain research experience abroad as part of their PhD studies, and to return to academic positions.

BiH legislation provides limited organisational autonomy to the higher education institutions (HEIs) because it determines the internal governance and management structure of the universities. Detailed legal provisions set up the competencies, responsibilities and relations between the three key bodies – law has described the governing board, the rector and the senate.

The governing boards are composed of internal and external representatives. The governing board is conferred with important and broad competencies including, among others, authorities related to statute of the HEI (in some cases), and other general acts on internal organisation and systematisation of jobs. The board adopts financing and development plans, the annual work plan and respective reports. It is authorised to guide, control and assesses the work of the rector in the area of financial affairs.

²⁸ The Strategy for the Development of Science in BiH 2010-2015

²⁹ Ibid

³⁰ Ibid

The rectors in BiH were granted more authority because they are put in an extremely challenging position due to the restructuring of the universities into integrated institutions. This complex process is highly demanding in many aspects including financing, human resources, culture, and mentality. It is hard to say that there had been some kind of a preparatory programme for the leadership to support the universities in addressing these challenges.

Within the new legal framework the senate of BiH universities has been provided with satisfactory competences for accomplishing their important role in formulating decisions related to all academic issues. The Senate also has authority in adopting the statute of the universities and to thereby contribute to a sound management structure and a balanced distribution of competencies and responsibilities. This is of substantial importance considering that the Senate is the most representative body for academics and especially for students, who are to represent in the Senate by no less than 15%.

The position of the faculties in the organisation of the BiH universities is subject of deepest changes in accordance with the new legal regulations abolishing their status of legally and financially independent bodies. The new status of the integrated universities is designed in line with the provisions for full legal personality of the public universities in relation to their overall functioning.

Financing of higher education (HE) in BiH is a central issue as it is in other countries. However, due to the overall organisation of HE in BiH, involving numerous stakeholders at country, entity and cantonal levels the setting up of a common, or at least, a well harmonized financing policy and practice presents itself as an extremely difficult task. The Framework Law on HE does not address the financing of higher education, thereby leaving this issue to be treated at the level of the individual entities and cantons.

In BiH universities funding system only rely on block funding. The block funding (institutional or general funding) is attributed directly to universities for their institutional tasks. There is no institutional funding allocated to universities for research, this being exclusively devoted to teaching and accordingly calculated predominantly on the basis of the number of students. Public competitive funding is made available through specific instruments (grants competition) directly to individual researchers or research units.

There is no effective monitoring and review system in place making full use of output indicators due to weak system for collecting and processing of data. As it is the case for the competitive project funding, the responsible ministries for science in the country adopt the Rulebook on criteria for appointing experts and procedure of assessment of research projects. These Rulebooks prescribe more precisely the criteria for appointing experts (reviewers) by the relevant ministries as well as the procedure of assessment of research projects. The ministries keep a register of experts, for scientific areas, on the basis of references of researchers. The national funding is not allocated through international evaluation procedure.

5. Facilitate partnerships and productive interactions between research institutions and the private sector

As BiH is still striving to establish functioning R&D systems there has been no specific measures, schemes, initiatives, programmes, laws, technology transfer office etc. to foster the creation of university spin offs. Since no reliable data exist on mobility of researchers there is no evidence, which can support presence of intersectoral mobility i.e., mobility between public and private institutes.

Overall, preparations in the area of industry and SMEs remain at an early stage. Bosnia and Herzegovina has to develop a comprehensive industrial strategy and to implement the State level strategy for SMEs. BiH has a status of potential candidate country and thus, the European Regional Development Fund (ERDF) is not available to support promotion interaction between research institutions and SME.

Policy measures related to the intellectual property protection and patents have been recently developed. The State-level laws governing industrial property and copyright and related rights regulate these activities. However, there are still modest capabilities regarding IPR, which requires a systematic approach to develop the strategy and policy on this matter.

Government-owned research results are made available however, not fully utilised. Moreover, they are not adequately monitored. There are no special legal regulations covering the field of intellectual property rights (IPR) on the BiH universities. It is likely that many opportunities for commercialisation of research results are not utilised.

The special mobility schemes allowing R&D students/PhDs/ to conduct innovation projects in firms are not present.

Involvement of private sectors in the governance bodies of HEIs and PROs is marginal, usually one representative from private sector within a body of 10 to 15 appointed members, with low impact on the development of an institution in question.

6. Enhance knowledge circulation across Europe and beyond

The main instrument is the Component 2 of the IPA focused on the cross – border cooperation between BiH and non-EU countries (Serbia, Montenegro B&H) as well as IPA ADRIATIC CBC. With the exception of the Priority 1 of the IPA ADRIATIC CBC (<http://www.adriaticpacbc.org/>) that includes Measure 1.1. Research and innovation, other programmes are mostly aimed at the development of economic and social cross-border activities, solving common infrastructural or communal problems, cultural cooperation, tourism, etc. The SEE-ERA.NET PLUS programme could be considered as a sort of cross border cooperation since it is aimed at enhancing the integration of the Western Balkan countries by a Joint call for European research projects.

There are no recent measures that support the development of a sustainable, efficient and effective European scientific information system.

There are no recent measures that support open circulation of knowledge across national borders and open access to research outputs (publications and data) by researchers and society at large.

7. Strengthen international cooperation in science and technology and the role and attractiveness of European research in the world

BiH does not have a special strategy for international research cooperation but several policy documents related to more intensive participation in the EU framework programme and mobility could serve this purpose.

According to data of the Ministry of Foreign Affairs on bilateral cooperation on S&T, BiH concluded agreements on science cooperation with Albania, Bulgaria, Egypt, France, Greece, Croatia, Iran, Italy, Kuwait, Germany, Turkey, Montenegro and Slovenia. In these agreements, signatory countries expressed their willingness to intensify their cooperation in the field of science.

The most tangible results can be seen in the implementation of the Cooperation Agreement with Slovenia³¹ and Montenegro.³²

Apart from the abovementioned, BiH academic community signed numerous bilateral agreements on international cooperation with foreign institutions (agreements between faculties/colleges, universities, institutes etc.) that also cover S&T. Consequently, this type of activity mostly comes down to individual researcher participation in larger EU projects where BiH researchers often complete their master's and doctoral degrees in science, mostly in the biomedical and technical fields.

³¹ <http://www.mcp.gov.ba/vijesti/Default.aspx?id=2627>

³² http://www.mcp.gov.ba/org_jedinice/sektor_nauka_kultura/konkursi/Archive.aspx?template_id=19&pageIndex=1

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List of Abbreviations

BAMONET	Development of Network Mobility Centres in Bosnia and Herzegovina
BERD	Business Expenditures on Research and Development
BiH	Bosnia and Herzegovina
BIP	Business Innovation Programme
BMZ	German Federal Ministry for Economic Cooperation and Development
COST	Competitive Regional Economic Development
CREDO	European Cooperation in Science and Technology
EBN	European Business and Innovation Centre Network
EBRD	The new European Bank for Reconstruction and Development
ECTS	European Credit Transfer System
ERA	European Research Area
ERA-NET	European Research Area Network
ERDF	European Regional Development Fund
ESFRI	European Strategy Forum on Research Infrastructures
EU	European Union
EU-27	European Union including 27 Member States
FBiH	Federation of Bosnia and Herzegovina
FP	European Framework Programme for Research and Technology Development
FP	Framework Programme
FP7	7th Framework Programme
FTE	Full time equivalent
GBAORD	Government Budget Appropriations or Outlays on R&D
GCR	Global Competitiveness Report
GDP	Gross Domestic Product
GERD	Gross Domestic Expenditure on R&D
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GOVERD	Government Intramural Expenditure on R&D
HE	Higher Education
HEI	Higher education institutions
HERD	Higher Education Expenditure on R&D
HRST	Human Resources in Science and Technology
IBN	Innovation Business Network
ICT	Information and Communication Technology
ILO	International Labour Organisation
IMF	International Monetary Fund
IP	Intellectual Property
IUC	Innovation Union Competitiveness
LFS	Labour Force Survey
MNCs	Multinational Corporations
MoCA	Ministry of Civil Affairs
MoFTER	Ministry of Foreign Trade and Economic Relations
NUTS	Nomenclature of territorial units for statistics
OECD	Organisation for Economic Co-operation and Development
ORF	Open regional fund
PPS	Power Purchase Standards
PRO	Public Research Organisations
R&D	Research and development
RI	Research Infrastructures
RS	Republic of Srpska
RTDI	Research Technological Development and Innovation
S&T	Science and technology
SCI	Science Citation Index
SEE	South East Europe
SIDA	Swedish International Development Cooperation Agency
SME	Small and Medium Sized Enterprise

TAM/BAS
WBCs

Turn-around Management and Business Advisory Services
Western Balkan Countries

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Abstract

The main objective of the ERAWATCH Annual Country Reports is to characterise and assess the performance of national research systems and related policies in a structured manner that is comparable across countries. EW Country Reports 2011 identify the structural challenges faced by national innovation systems. They further analyse and assess the ability of the policy mix in place to consistently and efficiently tackle these challenges. The annex of the reports gives an overview of the latest national policy efforts towards the enhancement of European Research Area and further assess their efficiency to achieve the targets.

These reports were originally produced in November - December 2011, focusing on policy developments over the previous twelve months. The reports were produced by the ERAWATCH Network under contract to JRC-IPTS. The analytical framework and the structure of the reports have been developed by the Institute for Prospective Technological Studies of the Joint Research Centre (JRC-IPTS) and Directorate General for Research and Innovation with contributions from ERAWATCH Network Asbl.

As the Commission's in-house science service, the Joint Research Centre's mission is to provide EU policies with independent, evidence-based scientific and technical support throughout the whole policy cycle.

Working in close cooperation with policy Directorates-General, the JRC addresses key societal challenges while stimulating innovation through developing new standards, methods and tools, and sharing and transferring its know-how to the Member States and international community.

Key policy areas include: environment and climate change; energy and transport; agriculture and food security; health and consumer protection; information society and digital agenda; safety and security including nuclear; all supported through a cross-cutting and multi-disciplinary approach.



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